

A
DISCOURSE
ON THE
CULTIVATION
OF
Waste *and* Barren Lands.

Translated from the FRENCH of the
Marquis DE TURBILLY, for the
Benefit of the Farmers of *Great Britain*
and *Ireland*, where these uncultivated Lands
too much abound.

Inscribed to the HONOURABLE
THOMAS CHOLMONDELEY, Esq;

PART I.

— *mutato nomine, de te*
Fabula narratur. — HOR.

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M DCC LXII.

DISCOURSE
ON THE
CULTIVATION

OF
WATER AND WINDMILLS

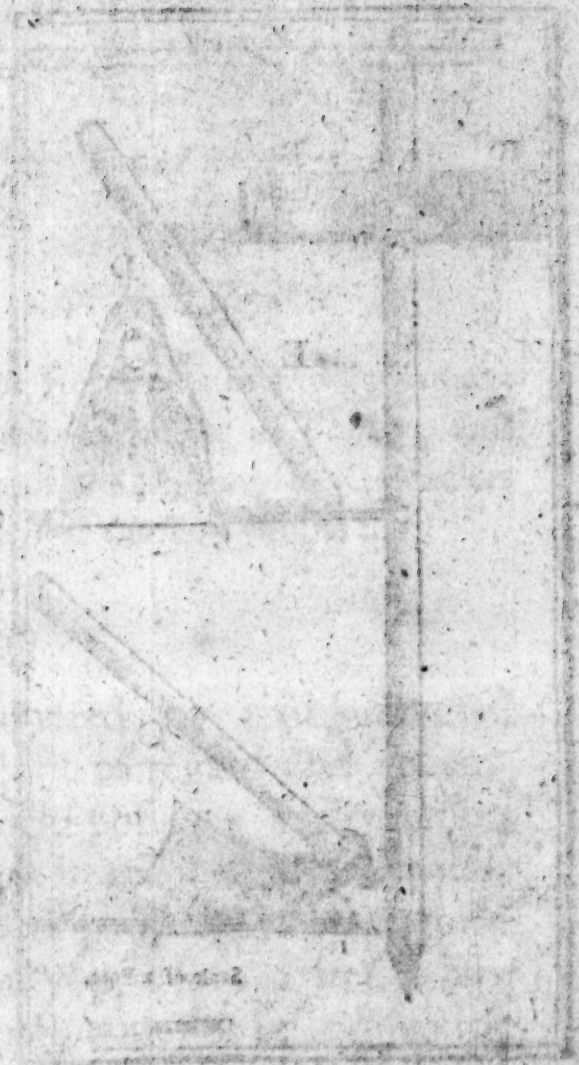
Translated from the French of the
Monsieur DE TURBILLY, for the
Use of the Farmers of Great Britain
and Ireland, who are desirous to
improve their Land.

By
THOMAS CHANDLER

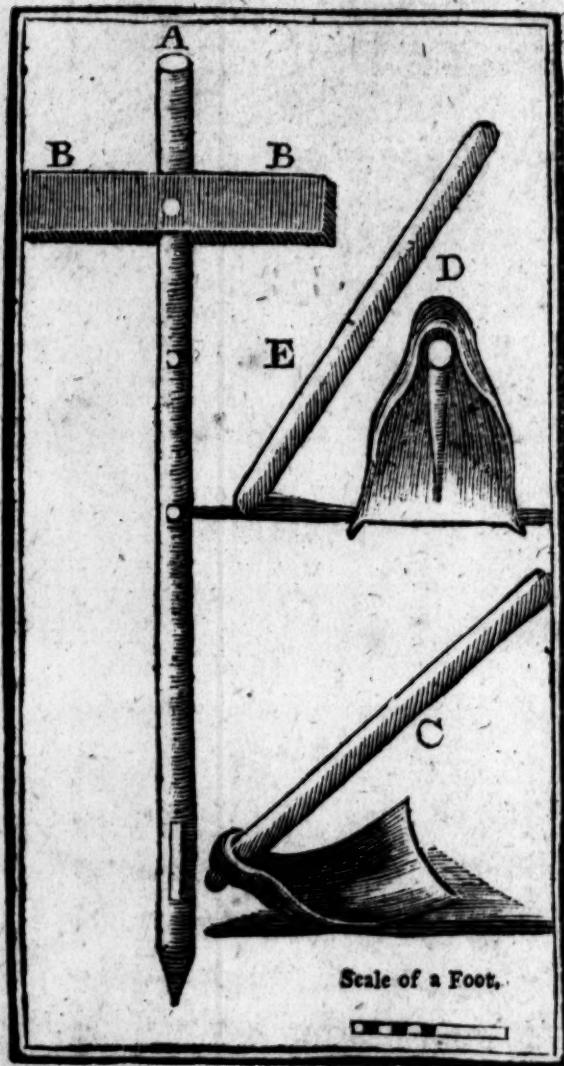
PART I

LONDON





1. John B. Woodhouse, C. C. of
or John B. Woodhouse, C. C. of
the City of New York.



A Borer. B Wooden Handle. C Cob
or Cobbing Knife. D The Iron Part of
the Cob. E Wooden Handle of the Cob.

TO THE TRULY HONOURABLE
THOMAS CHOLMONDELEY, Esq,
Of Vale Royal,

One of the Representatives in Parliament
 for *Cheshire*, Mayor of *Chester*, and
 Captain of a Company of Grenadiers
 in the Royal *Cheshire* Militia :

S I R,

A Nimated by that universal
 spirit of regard and veneration
 which possesses and prompts
 every man in the county to honour
 and respect you, and all the world
 to esteem you, a farmer in *Cheshire*
 presents you with this little discourse
 on the husbandry of waste and
 barren lands.

A

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Among

Among your extensive estates, you have many such waste and wild tracts of country.

You take delight in giving pleasure to mankind; and I may venture to say, nothing would make your neighbours happier, than that the experiments and practice your love for the public may promote, might redound to your private emolument, by increasing those riches you so nobly and prudently distribute to the best of purposes.

Whether in your civil or military capacity, you captivate the hearts of all that approach you; your presence inspires concord and good-humour.

Cheshire, tho' ever accustomed to admire her gallant and meritorious sons, doats upon you, her darling favourite.

You alone will ask, Wherefore?
Let not me therefore, Sir, offend
your

your modesty, while I only utter the voice of the people.

They respect, in you, a name ever dear to this county, a name which carries with it every idea of every virtue; a name, which brings to the recollection of the aged, the grateful remembrance of your ancestors; to the contemplation of the young, your own personal excellencies.

Your affability, your humility, your good heart, your right head, your ingenuous, unaffected deportment charm them, and those free, brave, and glorious youths who compose your company of grenadiers, think themselves happy to be selected under your command, to serve their king and country.

Thousands, were there occasion, are ready at your summons to follow their example, under the virtuous banners of such a monarch,

and the auspicious conduct of such an officer.

But we farmers, who cultivate the arts of peace, flatter ourselves, that after bringing the enemies of *Britain* to reason, your illustrious swords will equally shine, when converted into plowshares; and I hope, that when the *British* arms shall have conquered the legions of *France*, my author, tho' a *French* officer, may contribute by this essay to teach your Honour to cultivate the plains of *Vale Royal*, and to meliorate the heaths of *Delamere*.

In antient days, foreign conquests entailed foreign luxury on the conquerors: in our happier times, we have beat the *French* into a love of agriculture; and our soldiers will return home not fops, but farmers.

I look upon it, as a debt due to *Mr. Du Hamel*, who dressed our great *English* husbandman, the celebrated

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lebrated Mr. *Jethro Tull*, in *French* cloaths, to return the compliment, by putting this *French* officer and laudable patriot in an *English* dress. I wish it may be of service to the public: I must confess it is a great pleasure to me, to have this opportunity to testify how sincerely I am, Sir,

Yours,

A FARMER in CHESHIRE.

A 3 THE

The TRANSLATOR'S P R E F A C E.

Gentle Reader ;

FOR such I esteem every lover of husbandry to be ; I have put this discourse in an *English* dress for your service. The errors you may find in the terms of husbandry, I desire you will excuse, and correct. The instruments of *French* agriculture are not totally similar to ours, and I write in the country, where I have not a technical dictionary to resort to. The hoe, for raising of turfs or fods, I have called a cob or cobbing-knife, and the like liberty I have taken in other things. The bookseller will receive, with pleasure, any corrections or amendments from any of you for his second edition. If this discourse should not satisfy the
adepts

adepts in husbandry, if they should find nothing new in it, it may however prove of use to beginners; it may tempt idle men to read it, and encourage them to industry. If it should convert any of the abandoned idle pests of all countries, and useless crowders of all companies, to rural occupations, I shall think my time well employed.

It may be of great use to land-holders in *America*, some parts of *Great Britain*, and many parts of *Ireland*.

FAREWELL.

Quenam ergo tanta ubertatis causa erat? Ipsorum tunc manibus imperatorum colebantur agri (ut fas est credere) gaudente terra vomere laureato, & triumphali aratore: Sive illi eadem curâ semina tractabant quâ bella, eademque, diligentia arva disponebant quâ castra: sive honestis manibus omnia lætius proveniunt quoniam & curiosius fiunt. Plin. Hist. Nat. lib. xviii. c. 3.

What then was the cause of such wonderful fertility? The earth was in those days cultivated by the hands of our generals, and seems to have been delighted with the labours of laurelled conquerors: Whether it was, that they treated agriculture with the same attention they did war, and disposed their lands with the same accuracy that they marked out their camps: or whether it be, that every undertaking succeeds best in the hands of honourable personages, who are ever the most exact and curious in all that they design or execute. *Plin. Nat. Hist. lib. xviii. c. 3.*

T H E
P R E F A C E.

TO avoid the reproach thrown upon most treatises of agriculture, of being stuffed with heaps of useless pedantic erudition, I have omitted all quotations from authors, however suitable they might appear ; and the above citation from *Pliny* is the only one the reader will find throughout the whole book.

I have endeavoured to be as concise as the copiousness of my subject would admit, and the necessary explanation of some essential particulars.

The utility of the public is my only aim ; which I should greatly miss, if farmers and husbandmen are not the better for my labours.

They have no occasion to learn the methods *grandeess* should make use of, nor
what

what means the government may employ to encourage the cultivation of barren lands: it is of more consequence to them to be taught the different ways by which they may improve their waste grounds; for which reason I have separately collected for their use the practical part of this species of husbandry contained in the First Part, and printed it by itself at the lowest price possible, that all in general may afford to buy it.

INTRO.

INTRODUCTION.

OF all the objects which merit the attention of government, there is not one of greater importance than agriculture. One sees in France such a quantity of waste and unprofitable land, that every patriot citizen, who travels into the provinces, must heartily lament it.

This kingdom, happy in the temperature of its climate, adapted to different productions, is near half of it uncultivated, and the other half so badly cultivated in general, that, were it properly so, it would produce at least double to what it does.

As it would require a large volume to be particular in directing a better culture for those lands which are already under cultivation, I shall confine myself solely to the improvement and preparation of such lands as are actually waste. I shall advance nothing that I have not myself tried during

during the course of twenty-two years practice, with all possible care and application: Having found the greatest part of my land totally neglected, I set about amending a certain quantity every year, it not being in my power to undertake it all at once. The success I have had encouraged me to continue my operations. My improvements in Anjou, and my labours in all sorts of soils, are at this day very extensive and profitable.

This my long experience has been aided by my observations in many parts of Europe, where I had travelled with that spirit of curiosity and attention, which is natural to every lover of agriculture, who wishes to benefit by the discoveries of different nations. My taste led me to such researches, and I was animated by the double motive, of being useful to my country, and of improving part of my own waste lands. The public good concurred on this occasion with my private interest, therefore the reader may confide in what I shall deliver on this subject.

Most

Most of the writers on agriculture have wanted the necessary experience: without a long and extensive practice, this science, the most useful of all, can be but trivially descanted upon; that is to say, without having for many years cultivated a domain sufficiently great, and composed of different sorts of soils, as well as productions, and entered into the whole detail of husbandry, it is not possible to comprehend it: with regard to being masters of it, nobody should pretend to it, the life of man being too short to acquire a perfect knowledge of this useful science. A multitude of reiterated experiments, and those compared with each other for many years, are often required to discover what is best, even in one article.

*A gentleman who has reserved out of his estate a small domain for his own cultivation, after a certain time, often imagines himself very skilful; but far from it, he is still ignorant of a thousand things that are essential. I have known many, who had even acquired some reputation in these mat-
ters,*

ters, on account of different experiments they had made; yet among all these laudable practisers, I have not met with that solidity of knowledge I sought after; I have even found it oftener among plain country farmers; but I owe my greatest lights in agriculture, and particularly touching the improvement of waste and barren lands, to what I have seen in foreign countries, where great lords and rich abbots have, for a series of years, cultivated large domains.

In order to treat methodically a matter so interesting as this of cultivating waste lands, and which is a subject almost quite new, as those who have treated of it hitherto have handled it very superficially, I shall divide it into two parts.

The First shall be purely relative to the practical operation, and will contain the manner and divers methods of treating these different species of waste grounds.

The Second will exhibit some matters of practice, and some of speculation. Practical, inasmuch as it will contain the narrative of my own improvements; speculative, as
it

it will indicate the methods which I think proper to make use of, as well as the means which may be employed to excite and encourage, as well the land-owners as farmers, to cultivate such parts of the kingdom as are now waste.

T H E

THE Marquis De Turbilly, an old officer in the service of France, having a small matter of patrimonial estate, retired thither at the close of every campaign during the last war, in order to give directions for cultivating and improving his lands, according to the methods that he saw practised in other countries. When the war was over, he quitted the service, retired into the country, and pursued his plan of improvements so happily, as to be at this day possessed of a very ample fortune. These memoirs in relation to rustick œconomy, and the art of reclaiming barren grounds, are the work of this gentleman, in which there appears not only sound sense and great sagacity, but a magnanimity also worthy of his birth and original profession.

A

DISCOURSE

ON THE

CULTIVATION

O F

Waste *and* Barren LANDS.

P A R T I.

WHEN waste barren ground is intended to be cultivated, the first thing to be done is to bore it in several places, to the depth of eight or ten feet, in order to discover the nature of it, and the thickness of the various strata that are found there. These always lie horizontally, as I have remarked in many countries, when I have descended to the depth of three hundred feet in the mines.

B

This

This trial may be made at an easy expence, with the assistance of a borer, composed of two bars of iron, rounded, six feet long each, and two inches thick, screwing one into the other: each of these bars must have holes through them; to wit, the first at three, four, and five feet high; the second at every foot, to admit little iron pins, which serve to support a wooden handle of two feet in length, and five or six inches in thickness, in which there is a hole large enough for the iron bars to pass, which will make the figure of a cross. This wooden handle holds the borer, and serves to speed it successively, beginning with the first bar; whether it is turned and twisted in the earth, or raised and fallen with force, when it meets with stones.

At the end of this first bar is fixed a steel point, four inches long, strong, and somewhat bluntish; this is likewise screw'd into the bar, in which, four inches higher, is made a groove on one side, of half a foot long, to receive the matter of the different soils. Such is the construction of this borer. When it is made use of, you draw
it

it up at every six inches, to examine the soil contained in the groove; it is requisite to be provided with this instrument, which one or two men can work with pleasure. In this manner, to look for minerals, I have seen people bore to the depth of one hundred feet or more. The operation was the same; the number of bars of iron of the same length, screwing equally one into another, and holes, at the distance of a foot, were only multiplied: After a certain number were added, in raising and falling the machine, it entered the ground considerably, by the force of its own weight, and pierced through the hardest rocks. Steel points, of various shapes, were in readiness to succeed such as were worn and spoiled. Sometimes, in the place of these steel points, an augre, not unlike that which the carpenters use, was screwed into the bar; in the hollow of the augre was contained the soil of the bottom of the hole so bored. The lifting up these bars of iron every now and then, to observe the changes and nature of the

strata, renders this work a little tedious. In drawing up these bars, care must be had to prevent the borer from slipping from you, which would occasion trouble and expence to recover ; this is best done by stopping its retrogradation by iron pins, thrust through the holes made to support the handle, as often as it is removed higher or lower, and which holes are likewise destined to this use.

I have described this operation, for the satisfaction of those who may have the curiosity to bore their ground deeper than I have required ; and who may be desirous to acquaint themselves with the nature of the subterraneous soil.

When by the borer you are made acquainted with the quality of the soil of your lands, it is then indispensably necessary to lessen and diminish the enormous quantity of game, and to leave but just enough for use and sport, but not sufficient to do injury ; it will be likewise requisite totally to banish and confine all rabbits to their warrens. These mischie-

vous

vous animals are born enemies to agriculture; they spare neither corn, plants, or nurseries of trees; when they are suffered to multiply to an excess, they ravage a whole country, and render themselves in a manner masters of it. All stags and hinds, which our laws prohibit us to hurt, must be kept off by every method that can be legally taken: they eat and trample the corn; and so do the wild boars, who moreover root with their snouts. Unless you can defend your grounds from the damage of all these enemies, I would not advise you to undertake to reclaim your waste lands. After all your labour and costly pains, it would be in vain to sow; this multitude of game would devour all, and you would reap nothing. This is a real scourge to all lovers of husbandry:

I repeat it, I mean only the too great quantity of game; I am far from wishing the total destruction of it: my meaning is, that it should always be sufficiently preserved, even for the amusement of sportsmen, and for a noble and blameless exer-

cise, for those who are intitled to such recreation. I well know that the forests, as well as the plains, are destined to contain in their limits all kind of game; but it would be wrong to let that increase to such a degree, as to lay waste a whole country, and rob the human inhabitants, for whom the earth was preferably made, of their natural subsistence. A certain harmony and proportion, necessary for their preservation, ought always to subsist amongst all animals in this world. When one species encroaches on another, this harmony is interrupted, disorder ensues, and every thing is injured and suffers. I have seen countries formerly well peopled, well cultivated, and extremely fertile, which, from being abandoned to an excessive increase of game, have totally changed their condition: the inhabitants, impoverished and wretched, have for the most part deserted it; the grounds lie neglected and untilled. The Lords of these countries, who, without meaning it, were originally the cause of all this mischief, did

did not imagine it would affect them, because their revenue arose, for the most part, from regular falls of wood, and from the rights of seignior, &c. but they were deceived in their ideas: The game, after ruining their vassals to such a degree that they were not able to pay their quit-rents, and not finding any thing more to eat, fell upon the lords woods, and damaged them greatly. The rents of these lords have continued to decrease, and at present are reduced to a small matter, and in time, if they do not apply a remedy, will fall to nothing; and in the end, they will find themselves lords only of a desert waste country. These are the melancholy effects of a too enormous quantity of game. This digression, upon an article of such importance, appear'd to me to be necessary.

It is likewise proper here to take notice of three obstacles which often occur, at least of some of them, when we attempt to cultivate waste lands; these are, water, stones, and roots.

It would be to no purpose to sow

wet watry soil; the corn would rot in it in the winter, we should lose our time, as well as seed. Water is remedied by ditches, drains, gutters, and deep trenches, filled with stones taken off the same field, and covered with soil sufficient to admit the plough to pass over.

There is no ground, however even it may appear, in which, by using the level, you will not find some fall; of which you must take advantage, by employing these different methods. If it should happen, as it sometimes does, that the adjoining grounds are higher than those you are about to improve, and occasion the water to lodge, you will certainly find, not far off, some hollow way or low ground, into which you may carry it, by means of a deep covered underground drain passing through these neighbouring grounds.

With regard to stones, it is absolutely necessary to dig the ground, and to, at least, take away such as are big enough to hinder the plough. If any considerable rocks are met with, they may be blown up at a
small

small expence by gunpowder, taking proper precautions, for fear of accidents.

If these stones are not wanted, and there is no spare place to put them in, you may make holes on the spot, and bury them so deep as to admit of soil to be laid on them, sufficient for the passage of the plough: I know, by experience, that corn prospers well on these spots. At your leisure, it will be right to pick off all the stones that are bigger than one's fist; but this is not the place to speak of that.

With regard to roots, it is absolutely necessary to cut up with a pick-axe all such as are capable of stopping the plough, and possibly breaking of it, or are so strong as to hinder the effect of the instrument, which, in Anjou, is called (*Ecobüe*) a Cob, which I shall hereafter speak about; such as the roots of trees, thorns, juniper, in fine, all such as upon inspection you shall judge necessary to remove. Large stumps of timber, you may, if you please, blow up, as I directed you to do with rocks. As to the smaller roots of common heath,
broom,

broom, bulrushes, which are not strong enough to interrupt the plough or the cob, this is not yet the juncture to attack them.

Hitherto we have taken all possible precautions; we at first marched with our borer in hand, then routed our enemies that interrupted our enterprise, and have conquered the obstacles that opposed us: at present, let us consider the sort of land we are about to clear, and prepare by cultivation; and in what manner we shall go about to bring it into profit.

There are many sorts of waste land in France; one sort covered with heath or broom, the others neglected desarts; some more or less dry; not to reckon the fens and marshes, which would require a treatise apart; and therefore I shall speak of them but very superficially.

These waste grounds are commonly divided into three kinds:

Bad; of which I shall now treat.

Indifferent; of which I shall next discourse. And

Good; with which I shall finish.

The

The order of our process, or march of our improvements, demands this gradation.

The lands which all the world look upon as bad, and which in reality are the worst, are those hot and burning sands, which, when mixed with lime, are fit to make mortar: some of these are white, some yellowish and reddish; these are generally abandoned as quite barren; and yet the Creator of all things has made nothing in vain; he has ordered man to cultivate the earth, and told him he should thence draw his sustenance, not even excepting the worst of soils; and in truth, there is no ground, however unpromising it may appear, but will produce, when it is laboured, and pay for the trouble and pains it has cost to cultivate.

Of these hungry sands, some produce nothing at all; these are very rare; others bear nothing but moss, or here and there a sprig of heath, mixed with a few blades of grass: if these cannot be made so valuable as other soils, they cost, however,
much

much less to amend. In these we seldom meet with the three obstacles of water, stones, and roots, which I have above said were first to be got rid of. If they produce nothing at all, we may cross-plough them, and sow them as I shall explain: If they produce little short heath, mixed with some herbs as I mentioned above, these may be set fire to, to burn as they stand. When it happens that the heath and herbs are so thin that the fire cannot reach them, it is no great matter, as their roots are not capable of interrupting the plough: You will proceed, and in the beginning of spring, in a dry time, plough this ground*. Fifteen days after, it should have a second ploughing across, with the same plough: What we aim at is to destroy the roots of the moss, heath, and weeds, which stupify the soil; to this end, therefore, in fifteen days more, get some women and children, with iron and wooden rakes, to break all the lumps, draw out the roots, shake them and dry them, and

* The original has Avec la charrië à une oreille.

when

when dry, put them in little heaps, and burn them, and spread the ashes, which should be immediately buried by a third ploughing with the same plough, in the same direction as the first. The labour of these women and children will cost very little.

Some time after [this third ploughing, if you chuse it, you may run a light harrow over this sand; a heavy harrow would be too much for it; afterwards you may dry it reasonably, either with natural or artificial dung, which last I shall hereafter describe; then you should sow it in the ordinary season with French wheat.

This is no despicable grain; it yields greatly, sells well, and is very proper to fatten swine or fowls; in some parts of *Anjou* they make bread of it, as they likewise do in *Maine*, *Normandy*, *Bretagne*, and other countries. This grain flourishes best in these kind of sands, which it delights in: the crop in autumn will amply repay the expence of clearing and preparing the land.

If this ground is not destined to be
sown

sown with other grain, it is useless to improve it any further; all that needs be done is, as soon as may be after harvest, to plough it, in order to turn up the roots, and bury the stubble, which would give a bad quality to the ground; and the following year it may be sown again, after you have dunged it, and given it the necessary dressings.

The second crop, which will be better than the first, will be all clear profit; afterwards this land may rest for a year, after which, every other year, it may be sown in the same manner with *French* wheat, which will thrive well in it. It is not possible to procure with a less expence a reasonable profit from such poor land, and which in general affords no profit whatever.

If this land is intended to be planted with timber, no dung at all should be used; and after the first crop of *French* wheat, which grain I recommend for this purpose. During the winter give it two ploughings; in the month of *March* it should have a
third;

third ; then, in a dry calm day, sow it very thin with fir-seed, otherwise called pine-seed, of the smallest kind. As this is very small, the sower would do well to mix it in his hand with sand, lest it should otherwise be too thick sown, which generally happens to be the case. Let the sower be followed by women and children, with wooden rakes to cover the seed ; for as it does not require to be covered with above an inch of soil, the harrows would bury it too deep.

In this manner I have sown several parcels of such ground with success; among others, about ten years ago, I employed a considerable tract to this purpose, and it is already a very thriving wood. The firs are twenty-five feet high, and thick in proportion ; they have been lopped several times, and the last lopping has afforded me this year some thousands of faggots, which are worth four times the money I laid out to clear and cultivate the land, and to sow it. These firs have now cones, wherein the seed is inclosed, which in process of time will fill all the country with firs.

firs. This seed proceeds from the cones, which fall to the ground, and open, and is carried by the wind to the adjoining grounds, and comes up almost every where, as I have seen in divers places ; it is very small, as I have above said, and a little quantity will sow a large space. In the county of *Maine* they commonly use thirty pounds weight to sow an acre of the same dimensions of ours in *Anjou* ; but experience has taught me, that we may safely retrench one half.

The wood of this fir, or pine of the smallest kind, of which I here speak, sells well ; it is a quick grower, and at the end of forty years is fit for many uses ; at fifty years growth it acquires its perfect maturity, and afterwards is upon the decline. It has this property, that when it is felled it grows again from the seeds which fall on the ground, and requires no sort of care. Cattle do this wood no injury, except in the first years, when it must be fenced with a good ditch. The stags are its greatest enemies, as I have experienced, when

when my firs were at the height of seven or eight feet ; they come from the distance of five or six leagues round the country, at the season they lose their horns, to rub themselves against these trees ; they broke or galled for many years several which have since died : This unexpected damage, never having heard of the like before, was very considerable, and would have been greater if these trees had not been too thick planted ; at present they are too large to be in any more danger. As this particular humour of stags is not generally known, I mention it that owners of these plantations may take proper precautions. It is only in countries where firs are rare that they are exposed to this injury ; for where they are in great abundance, the damage being divided, is scarce perceptible.

Let it not be imagined, because firs are not seen in a country, that the soil is improper for them. In the county of *Anjou*, where my estate lies, there was not so much as a single tree of this species,

cies, and yet they have succeeded very well. This tree grows the quicker the more it is lopped, and prospers best in these kind of sands. The Chesnut likewise grows here, but does not flourish so well; in some places, however, it may be sown. As to the Oak it does not prosper, makes small shoots, and in dry years mostly perishes; or, if it escapes death, is stunted, and seldom comes to any thing. In some countries, and particularly in *Austrian Flanders*, near *Cost*, I have indeed observed this sort of oak to flourish in these hot sands; but the bed of this sand was very shallow, as I verified by boring: immediately beneath it, I found a black, fat, moist soil, rich and deep, where the roots of the oak could easily enter, and find sufficient nourishment. When one is possess'd of this kind of soil, the oak may be sown without fear; it will prosper as well as the chesnut, wherever a sufficient depth of proper soil shall be met with near the surface: the borer will always direct this matter, and make you acquainted

acquainted with the depth of the bed of sand, and the quality of the soil which is found under it. You may likewise, for the greater certainty when you sow the fir-seed, sow here and there an acorn, or a chesnut, at sufficient distances from one another. The firs will be no impediment to their growth; if one does not hit, the other may, and at all events you are sure to have a wood of firs.

For this purpose, you must choose acorns, not from the true genuine oak, which produces the best bark for the tanners, but from another kind of oak, called in *Anjou*, Brose, which does not grow so tall nor so straight as the other, which goes into leaf later, and whose bark is rougher, and less esteemed by the tanners, and whose wood is harder: I believe it is of that species which the ancients call Robur. This kind of oak is chiefly adapted to make Coppices of, which grow faster than those sowed with the acorns of the genuine oak, and delights more in these

sands. I have sown in some places these three different sorts with good success.

If these hungry sands are destined always to produce corn, pulse, or other crops, either because land is scarce, or that there is no better, or because it lies near and convenient to a town, village, gentleman's or farmer's house, and consequently within reach of manure, or for any other reasons of profit or pleasure, without which I would not advise any one to attempt it, it will then be requisite to amend it thoroughly for a continuance.

To effect this, you must make holes at certain distances, to the depth of a few feet, more or less. Under this sand you are sure to find a bed of fat earth, either argil, potters clay, marl, or otherwise; you must take a sufficient quantity of this fat earth, and carry it in wheel or hand-barrows, and lay it on the surface of the ground in little heaps near one another, it being necessary to lay on as much more as you generally do of marl for corn: this may be effected without carts, horses, or oxen.

oxen. Then you must fill up all the holes, which, by taking the fat soil out of them, will be still lower than the common level; these must be filled with mould taken from the adjacent grounds, to the depth of six inches, a proportion to be observed throughout, as that is of a more fertile nature than the soil at a greater depth, which has never felt the influences of the sun or air.

I must here observe, that when a hole is made in a good soil, the earth which is taken out swells so much in the air in twenty-four hours, that the same hole will not contain it again. The reason is very plain: the pores of the good soil being very open, the air, the dew, and the moisture enter fast, and augment its bulk; on the contrary, this kind of hungry sand or gravel, which I now speak of, is not properly to be called earth, it being a mass of little flints, whose pores are so close, that it is with difficulty they are penetrated by the air and moisture; so that when you make a hole in this kind of soil,

which is the worst of all, what came out scarcely will suffice to fill up the hole again. It is almost a general and infallible rule to judge of the degree of goodness of a soil you would improve, to try it in this manner, by making several holes of equal depth and width: that soil, which, after being some days exposed to the air, swells the most, is the best, and its comparative goodness may be ascertained by the greater or less quantity of earth which shall remain after filling up their several holes: the worst soil will be that which only barely fills the holes, or even comes short of it.

I return to the little heaps of clay or other fat earth laid out on the surface of the ground, sufficiently near to each other, in the manner I have above-mentioned; the poorer, drier, and hotter the sand is, the more heaps there should be. This work being done at the idlest times, will not be so costly as might be expected, for these sands are very easy to dig and stir. These heaps must be left untouched all
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the winter and a part of the spring, that they may be benefited by the sun, air, dews, frosts, and snows, after which they will pulverize easily like ashes; this must be spread over the land, which must immediately have a light ploughing, to begin to mix it with the sand; fifteen days after it must have another deeper ploughing, and so successively till this fat earth is sufficiently mixed with the sand. These ploughings, as well as all those I have hitherto spoke of, must be performed with a little light plough, the most suitable to these kind of sandy grounds; a couple of heifers or two asses will often suffice, which saves charges. Afterwards this land is to be manured with natural or artificial manure, in the same quantity as is used for other lands, and it must be sowed with rye in the season that best suits the country, the custom and practice of which I advise to follow in this article, unless there are very strong proofs of its being bad.

The usual time to sow rye or wheat in

Anjou is from the beginning of *October* to all *All-Saints*. I have found by experience, that this practice suits this climate.

The first crop had from waste lands thus managed will be good, and will nearly pay for the expences of bringing the fat earth; and all the second and third, for which no manure nor dung will be wanting, will be still better, and almost all clear gain; for this barren land, thus amended, will bring rye for three years running. Nay it may be so improved, by giving it a larger quantity of fat earth, as to bring wheat the second and third year, and ever after.

By this method I have, it is now twenty years, transformed a piece of my dry sandy ground, which scarcely produced moss before. I sowed it the first year with rye; after three years I let it rest a year, and fallowed it with the rest of my ploughed grounds. It has been since ploughed, dunged, and sowed in its turn, with the greater and lesser grains like them; and as I have not observed that to
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this time it has been impoverished, this method must needs be satisfactory, which, with good reason, I call durable amendment.

At the worst, if at length this ground should happen to fall off, and its crops be lessened, it might be helped at a little expence, and that for a considerable time, by laying on again but half the quantity of fat earth I did at first. Moreover I do not advise any body to enter into the expence of thus rendering a hungry sand capable of bringing wheat; I cite this example only to shew the possibility and utility of the thing. I should be very well satisfied, for the good of the publick, to see a crop of rye on it, which may be had with a smaller quantity of fat earth than I have directed, which, as I have said, will not be very expensive.

The profits by rye will be sufficiently satisfactory. It is true wheat is more valuable than rye; but this is an excellent grain, it grows with less cultivation, and in greater quantity than the other;
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it is less subject to accidents, can be preserved with less difficulty, and much longer, and has a thousand other advantageous qualities known to all the world. The bread made of it is very wholesome: more than half the kingdom sow chiefly rye, and live upon it, which many mix with other grains. Lands good for rye are set almost for as much rent, and much easier, than good wheat grounds. Moreover, I have remarked, by my own memorandums, and comparative accounts of my yearly crops, for these twenty-two years past, that as to money, my rye lands have almost brought me as much as those under wheat, which have cost me more to cultivate. I confess that the straw of wheat makes a difference; it is more sought after, and much better for horses than that of rye; which however is not so contemptible as folks imagine, who employ it only for litter. Besides its being good for beasts, when mixed with a little hay, experience has taught me that it is excellent fodder for plough oxen, when

when mixed with an equal quantity of hay; they are in better health, and more vigorous with this mixture, than they are when they eat hay mixed with an equal quantity of wheat-straw.

It is very important to consume all the different productions of one's ground to the best advantage, even those which are the least valued. There is not one which may not be in some shape or other useful, even to the stalks of French wheat, which several leave on the place where they have threshed out the grain. I caused some to be dried, and gathered into a cock, and to be given in the beginning of the winter to my cows, which eat it willingly as long as it lasted; they were not disordered by it, neither did they grow lean, and they gave milk with it in the usual quantity.

This shews to what account one may turn these dry and hot sands, which produce nothing naturally but moss; and here and there some heath, with a few blades of grass. With respect to those
tracts

tracts of the same kind of sandy land which send forth a greater quantity of wild productions, such as heath, of the strongest, thickest growing kind, and where the turf or sod may be peeled and raised, as will be hereafter directed; these places may be cobbled up, in the same manner as is directed for the second kind, of which I am going to treat.

The indifferent soils comprehend such as are light, sandy, and gravelly, but which however are not proper, like the hungry sand, to make mortar with, when mixed with lime. This kind of soil abounds mostly in this kingdom: some of them are white, yellowish, reddish, brown, and black; they are more or less fertile, in proportion as a layer of fat earth, chalky or clayey, which is commonly found under them, is more or less distant from the surface; these generally produce heath, black or white broom, bulrushes, fern, furze, brambles, some thorns, and other wild productions, mixed with a little grass. From the height, thickness,
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and vigour, of this wild growth, one may easily form a conjecture of the degree of goodness of the soil, and of what may be expected from it. I have never yet been deceived in forming a judgment upon this evidence.

When you would clear and clean such a piece of ground as this, you must begin in the winter to get rid of the three obstacles above-mentioned, to wit, water, stones, and such great roots which the cobb knife is not capable of cutting. I have already mentioned this instrument, and shall describe it hereafter. About the middle of the month of *March*, and not before, for the reason I shall mention, you must set about cobbing this ground, that is to say, peeling it. To this end a number of labourers must be employed, in proportion to the quantity of land to be thus treated: these must be the strongest and ablest you can get, that the work may go on the quicker; however, every ordinary day labourer, good or indifferent, may work at this business;

business; but such as are too weak or too young, to wit, under fifteen or sixteen years of age, cannot be employed.

Each labourer destined to this work should be furnished with the instrument in question, called in *Anjou*, as I before said, a cobb knife. It is a sharp instrument, crooked and bending inwards, six inches long, and eight inches and a half broad at the bottom, lessening in its breadth upwards to the handle, where it is reduced to three inches; it must be made of the best iron. Its thickness must be proportioned to its size, strongest in the middle, and a sharp edge at the bottom; to which purpose you must not spare for good steel. There must be a hole in it to receive the handle, and this hole must be two inches diameter of the inside. The handle must be made of wood, and about three feet long, according to the height of the man who uses it. This tool may weigh, without the handle, from ten to twelve pounds, lighter it should not be. The ironmongers will
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get it made by a model or pattern; where I live, and in that neighbourhood, it costs about three shillings: I should imagine it would not cost more than four shillings in any country place; at Paris it may possibly stand you in five shillings. If the labourers you employ are so poor as not to be able to purchase this instrument, as it has happened with me, you may do as I did, advance them the money, and deduct it out of their wages, at two pence or threepence a day, till you are repaid the price.

You will next chuse out one of your stoutest and most intelligent labourers to lead the rest, for they cannot work in a row, as when they dig. This leader, holding his cobb knife between his legs, and bending his body, must give a stroke, cutting the soil, the first to the right, then a second strait before him, and finally a third to the left, by which means he will immediately raise a turf of about a foot and a half long, a foot broad, and four inches thickness of mould. He must
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place this turf, with one motion, with the same instrument on his right, in its natural position, with the mould side downwards. All the heath, broom, bulrushes, and other wild growth upon this land which is not too large, will come up with this turf, and will stick to it, like a kind of perriwig, the more the better. I said there must be four inches of soil, that is absolutely necessary; for if the land was peeled to a lesser thickness, the work would be badly done, for the cobb knife would not then have penetrated under the cluster of the roots of this rubbish, which must be absolutely destroyed, else they would make new shoots, injure the corn, and in time choak it intirely, as has happened to me in the beginning of my undertakings.

The labourers would desire nothing better, than to peel the ground as thin as possible, it would not be half the labour to them; and, if you let them this jobb by the piece, they would find their account in it, by the speed they would make;

make; but this would be an imprudent step, as I have experienced to my cost. Therefore they must be well watched; otherwise, besides the inconvenience of not effectually destroying the wild growth, you would have the loss of not having ashes enough sufficiently to mend the soil, as will be hereafter explained, if the turfs are not as long and as broad as I require; which will happen at first, till the people are dextrous at this work, when there will be no danger of this ever happening. The labourers indeed will not work so quick, till by use they are perfected in it. Their leader having cut a turf, and having placed it on the right, as I directed, he will advance a small step, and will take up another turf of the same dimensions and thickness, which he will likewise place on his right hand, before the first. Thus he will continue proceeding straight on before him, placing likewise all the turfs on his right in a straight line. As soon as he has taken up the two first, the second labourer must

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place

place himself a small step behind him, to the left of the first ; and, taking up turfs in the same manner, must place them likewise on his right hand, in the void space which has just now been peeled by the leader ; and, as these advance, each other labourer successively, one by one, must put himself on the left of the preceding, and do the same work. They will thus follow each other, like the steps of a stair-case, or like reapers. When they come to the end of the ground, which, considering the disposition of their march, will not be all together, the leader first, and the rest in succession ; this same leader must return to begin his work on the side where he first began, close to the earth that is already stripped ; and his companions must likewise follow him, repeating the same operation ; for this work must always be performed in the same direction, and not backwards and forwards. Thus they must proceed, till all the ground which is proposed to be cleared this year, is cobbled or peeled.

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This work can only be performed in *France* from the middle of *March*, till a little before the festival of St. *John* the Baptist, that is to say, during three months. This luckily happens not to be the busiest season of the husbandmen. Earlier in the year it would not be convenient to cobb, as I have already observed, because the turfs would strike fresh root; neither would later suit, because they would be in danger of not drying thoroughly. These three months, during which the sun finishes his progress, is the season when the earth is driest, in proportion as this luminary ascends. Some days after *Midsummer-day*, when the sun becomes retrograde, a dampness begins, and increases every day in proportion as he descends, till at length it becomes so considerable, that it retards the drying of the turfs, and sometimes even hinders it quite.

I shall not examine if this humidity is occasioned by an exudation of the earth, or whether it proceeds from the air, and

the vapours which mix with it : whatever be the cause, the fact is certain, and that is the most important to know, it being very necessary to this kind of improvement, that the turfs dry well ; to which end they are left in the posture before-mentioned. When the season is not wet, they are generally tolerably dry in three weeks, even without turning ; but in rainy years, they take a longer time to dry ; nay, they must be turned again and again, lest they should strike out new roots and shoots, which would hinder them from burning, as I have seen happen. These turfs are turned with a very little cost, by women and children.

It appears from this account, that in rainy years this method of clearing and cultivating ground becomes more tedious, difficult, and laborious, yet these additional expences are not very considerable. About *Midsummer*, or rather before, when the turfs are sufficiently dry, in fine weather, and never in rain, you must take a sufficient number of women and children, who

who with iron forks, and with their hands, gather up all these turfs, and from space to space build them up in the field into round heaps of about ten feet high, and as many broad at bottom, almost in the shape of charcoal furnaces. The turf, and what grows out of it, must be placed downwards, and the mould upwards. A small hollow must be left on the inside, where a kind of little chimney and hearth must be made, with an opening on the side to admit the wind. I have said this work must not be done in rainy weather; for, should these heaps happen unfortunately to be so wet as to let in the water, they would no longer burn; you would be obliged to pull them down, and spread the turfs on the ground to dry them, in the same position they were before in. You would likewise possibly be obliged very frequently to turn them, as has happened to me, which would retard the operation, and increase the expence; and it might happen, if the rains were frequent, that you could not get them

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sufficiently dry before autumn, which would occasion a great loss.

This last accident, though possible, is yet very rare; it never happened to me; and, upon inquiring of those to whom it happened, I was convinced it was greatly owing to their own negligence. To avoid these inconveniencies, the best method is to take advantage of the first fine weather, and, if it appears at all uncertain, to get more hands, without aiming at an injurious oeconomy. As the whole success of this husbandry principally depends upon the quick and timely operation of making and burning these clumps, you cannot therefore be too speedy. When rain threatens, let all hands be employed, men, women, and children. The moment the heaps are made, let them be set on fire; or, if the weather is settled, before you retire in the evening. They may be lighted by the children, with an iron fork, at the end of which a little burning straw or heath is carried to the hearths made in these

these clumps. The dry heath, rubbish, and grass, will catch instantly. In a few moments the fire will be so violent, that there will be no approaching it. Then you may leave it, having first taken proper precautions that it may not extend farther than it ought, where it might do mischief.

These furnaces must be left burning till next morning. When the fire will not be so furious, and you may approach it, you must then send a few people, women or children, with iron forks, to put up the turfs which have fallen down into the intervals, in the first fury of the flames. The fire will continue burning in these furnaces for some days, and the turfs will be consumed or calcined insensibly. If any of these are situated in wetish places, and will not burn, they must be mended, and the women and children must put some fresh fuel, straw, faggots, or dry heath, and bring some of the burning turfs from the adjacent clumps, to make them burn like the

others. When the fire shall be extinguished in all the furnaces, and they reduced to a heap of ashes, finer or coarser in proportion to the goodness of the soil, the women and children must then shovel them up into little round heaps, lest they should evaporate, if they are scattered about. Within these round heaps lies all our treasure; if they were open to the air, the greatest part of the salts which constitute our riches would evaporate. The dews at night, and the first rain which afterwards falls upon these heaps of ashes, form a crust on their surfaces, which prevents the effects of the wind and air, and keeps in their virtue and spirit; therefore the sooner there comes rain the better, after the operation is performed. If it should happen to rain, after the furnaces are well lighted up, unless it be very violent indeed, and of long continuance, it would not hinder them from burning; but this seldom happens at this season.

Moreover,

Moreover, on this occasion I must observe, that when this improvement is of a considerable extent of ground, and consequently the fire very great, it often disperses the clouds, and contributes to making the weather fair, in the same manner as the explosion of a cannon at a siege is found to do. The ashes being thus put into little heaps, there is nothing more to be done till you come to sow the ground. Care however must be taken, that neither men nor cattle approach these heaps of cinders to break the crust that is formed over them. Your land is now freed in general from all seeds, plants, and wild growth, as well as from all worms, insects, reptiles, and venomous animals; the action of the fire of the furnaces having been so strong as to heat not only the earth beneath them, to the depth of several inches, but likewise all the intermediate soil.

Fifteen days after the ordinary seed-time of the country will be the time to sow this burnt ground. If it be in *Anjou*,
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where they generally sow in *October* as I have said, then it may be sown a few days after *All Saints*. For this purpose, you must on a very still calm day send some women and children to spread the ashes with wooden shovels equally over the ground, excepting on those places where the clumps were burnt, which are so thoroughly baked or roasted as to want no help; since the best corn is always observed to grow on those spots. Some of these women and children should likewise bring iron forks to break and spread the sods about the furnaces, which may not be thoroughly consumed, but which will notwithstanding be very beneficial, as being in some measure baked or calcined by the action of the fire.

After this is done, let the corn be sown on these ashes by a skilful sower, whether it be rye or wheat; but let him not sow above half as much seed as is generally required for the same quantity of land in that country. The plowman with his team, whether it consist of oxen or horses, must

must follow the sower, and with a plough with two ears, stronger than those I have directed for the hungry sands, but yet not go too deep this first year; let him, I say, make two shallow furrows backwards and forwards, to cover the seed; then let women and children, with hoes and forks, break all the clods in these furrows, and divide all the bits of grassy sods they may find; and let them finish by rounding them up at top, which the plough in this first plowing cannot do with that exactness that is necessary. If you have many ploughs going at the same time, you must increase the number of women and children, and put a sower before each plough, as I always do.

These sorts of lands, thus managed, being difficult to sow in this manner with half the seed, the most dextrous are deceived; and as long as I continued to employ but one sower for several ploughs, I found the ill effects of it. When there is a person before each plough, he will sow much more equal; besides, he need
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lose no time, for when he is not employed in sowing, he may assist the women and children in breaking the clods. The plowman should always proceed slowly and with precaution this first time of sowing these new broke up grounds, especially if he suspects them never to have been plowed before. If it should happen that his plough is stopped by any stones or roots which may have escaped the endeavours already used to discover them, the same men, women and children, must take them up with crows or pickaxes, and throw them out of the field.

Care must be taken not to spread the ashes out of the heaps over more ground than can be sowed the same day or next morning, that the spirit of the ashes may not be wantonly evaporated. If however there should happen to come rain, or that the next day should be a holiday, you must cease from spreading ; but when the weather is settled, and no festival interferes, then spread them, for I have experienced, that at this advanced season
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there are often little frosts ; but, however, strong enough to congeal the ashes, and the clods that are not quite consumed ; which are no longer in a condition to be spread, till the sun has thaw'd them ; so that without this precaution a morning's work might be lost.

Most operations in agriculture are subjected greatly to the weather and seasons, which ought to be partly foreseen. If the sowing is performed sooner, there will be nothing to be apprehended from the frosts. I have experienced this. But then the corn grows too fast, it goes to ear too soon, the frosts catch it, and one reaps nothing but straw. The method above-cited is the best, and only one that is sure ; as I am satisfied by the experience of a number of years.

When this waste ground, so managed, is sown, gutters must be made with the same plough, either quite streight, or crossing the furrows, to humour the fall, and to empty themselves into the ditches of the inclosure, to carry off the water,

water, especially in winter. Some of the men employed in breaking the clods will finish these gutters, and clear the furrows where they join them, with the instrument which in *Anjou* they call pic, and in *Maine* croc ; which is a kind of hoe, with two flat iron teeth, about fifteen or eighteen inches long each, and has a handle like that of a cobb-knife. This instrument is very useful and necessary upon several occasions, and excellent for stirring the ground : it will serve likewise to break up some of the spots where the furnaces were made, and which the plough did not enter, and to finish the ends of the butts at the headlands, where it could not reach in turning, and where the grain, being imperfectly covered, would be quite lost, by being exposed to the air and the birds. Altho' the spirit and warmth contained in the salts of the ashes will in a little time greatly forward the corn, as there is now no grass, nor weeds, nor wild plants left, the seeds of which were all destroyed by the action of the

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the fire ; yet it at first appears to be very thin during a part of the winter ; but, on the approach of the spring, it will thicken and spread, and make such great shoots that it often at length becomes too thick. It is always ripe about fifteen days sooner than any other corn in the country. I said that the best was always found to grow on those spots where the furnaces had been burnt, the fire having had a greater effect in those places, and having penetrated farther into the soil.

I shall remark upon this, that the ashes containing all enrichment, as I have already taken notice, the more we have of these, the more fertile will be this improved ground ; but all kinds of soils do not equally burn to like quantities of good ashes. With whatever attention they are burnt, I have learned from several repeated experiments, that part of the soil and stones, according to their qualities, is reduced into lime, or is calcined by the operation of the fire, and that the remainder is vitrified. Those soils, which calcine
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most, are without doubt the best, and give the most ashes; those which vitrify are the worst, and produce the least ashes: of this sort is the sandy soil. One may judge with certainty of a soil that one is disposed to cultivate and prepare in this manner, by making this experiment on different parts of it. If you cannot visit it in person, you must have some sods of it brought you, of the thickness of four or five inches, which you may dry, and afterwards burn. You may also have brought you in caps of paper, numbered, samples of the soil, or stones taken from under the surface at every six inches, to the depth of eight or ten feet. These samples may be easily got with the borer which I have mentioned.

If you are not master of a borer, you must dig holes, which will not cost much to do; and by this means you will be able to judge what grain, timber, or other productions each soil is best adapted to. I have often tried this method with success for improvements that lay a such a distance
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that I could not immediately inspect them myself; but as to judge thus of lands, without visiting them, requires great application and long practice, the surest way is for every body to make the experiments on the spot. Those furnaces which are the most burnt, or that burn the fastest, are not the best; they consume the ashes too much, and diminish the quantity.

I have often remarked, that in those places where the upper turfs of the clumps, which had burned slow, remained almost whole, and were but merely calcined, inso-much that it was necessary to break them before the ground could be sown, the corn always flourished most, and much better than in those places where the furnaces, after burning every thing, were totally converted into heaps of ashes alone. In general those heaps, where the ashes after burning are white, are the least valuable, as well as least in bulk. This denotes vitrification more than calcination. In proportion as the ashes are yellowish, brown, or black, which is the

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degree

degree of their perfection, they are the best, and the heaps generally the largest. In proportion to these different colours, the calcination exceeds the vitrification. I have enlarged upon these different effects of fire; because they are very material to those who improve land in this way, and because nobody hitherto has given a sufficient account of it, for want of the necessary experience.

I shall observe upon this occasion, that those tracts of heath and broom, which have been previously set on fire, should not be peeled with the cobb-knife; because the naked turfs or sods would not burn for want of the wild rubbish growth to help them, as I have experienced. It will be necessary to wait till the heath or broom is sufficiently thick and tall, which will not often be the case under two years; for which reason the dangerous practice of the shepherds and country people in most parts, setting fire frequently to these broom and heath lands in the spring season, under a pretence of better-
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ing the herbage, is quite injurious to this copping husbandry, infomuch that it retards, nay even prevents it intirely, when these conflagrations are too frequent. This is not the only bad effect of this pernicious practice of the peasants, which ought to have been remedied long since; it is often attended with more dreadful consequences. The greatest care should be taken to preserve one's grounds from this injury.

In those provinces and countries where they do not use furrows, and where they plow in large beds or butts, or totally level, in order to sow afterwards with the harrow, I am of opinion they should notwithstanding, sow this copped land the first year under furrow, with a plough with two ears, in the manner before directed; but afterwards to conform themselves to the usage of the country. I give this advice, as I judge it to be best; and it will be well to follow it; a great part of the expence of plowing will be saved by it, the ashes will evaporate less, and they will preserve their virtue more. If, not-

withstanding these reasons, you will adhere strictly the first year to the practice of the country, in that case, about *Midsummer*, as soon as the furnaces are cooled, you should begin to spread the ashes in the manner I have already directed, without leaving any in the places where the clumps were burned. Immediately afterwards you must give the ground, with the precautions before given for the furrows, one light turn of the plough to bury the ashes. You must avoid spreading more ashes in one day than each plough can turn in on the same. A few days after this first plowing, you must give it a second, a little deeper, in the same direction; and you must continue thus successively plowing deeper and deeper, till you are arrived at a sufficient depth, and then you must give two plowings in the opposite direction, that is to say, crossing the first. After which, by a fifth plowing, the furrows will be brought to the direction they were in at first. Between these five plowings you must har-

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row often, with harrows heavy in proportion to the strength of the soil; and if there should be large clods, which the harrows cannot break, you must employ the women and children to break them, it being necessary to pulverize the soil as much as possible. I say as much as possible, because this first year it will be impossible perfectly to conquer them all.

The same women and children will likewise clear away all stones, if there is occasion. Each plowing, turning up the stones successively on the surface, you will make them pick off only such as are bigger than a man's fist. Each woman and child should be provided for this purpose with a basket proportionable to their strength; the weakest should put the stones into the baskets, the strongest should carry them to heaps made from space to space, one or two carts should be afterwards brought to carry these stones where they may be wanted; and, if they are not wanted any-where, they may be buried in holes made in the ground, with

a quantity of soil over them sufficient to give a free passage to the plough, as I have explained before. If there should be any stones too large for the women and children to carry, the carters will take them as they pass along; and when it happens that there are some under ground, so very great that the men cannot move nor load them, they must be broke with sledges and other iron tools fit for this work; or if they are great rocks they must be blown up with gunpowder; for nothing should stop us in the progress of this undertaking. The same thing must be done in those lands that are sowed under furrow, of which I have above spoke.

The time to sow this land this first year will always be, for the reasons I have given, fifteen days later than the ordinary time of sowing land in the country with the same sort of grain. You must give it another light plowing a few days before you sow; afterwards, at a proper time, you must sow half the usual quantity of wheat or rye as above-said, and this grain must
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be afterwards covered in either with the plough, if necessary, or with the harrows. You must gutter this land with the plough where wanting, as I have before directed, as soon as may be, in order to carry off the water during winter, and you must perfect and finish the gutters. If any very large clods are left on the ground, let them be broke to pieces by the women and children. This improvement being thus sown, there is nothing more to be done to it till harvest.

Having explained the different methods of sowing these lands, it is necessary I should make mention of those grounds which must always be sown in ridges or balks, and of those which it is better to throw into beds or broad butts, or to sow quite flat with the harrow. This preliminary consideration should have been discussed sooner: I have deferred speaking of it, that I might not interrupt the detail of the different operations practised in this copping husbandry. All things being equal, I should certainly chuse to sow in

beds, or quite flat with the harrows, rather than in furrows. Two advantages arise from using the harrow; the first is, you save one plowing, but the second is the most material. This interesting operation requires weather made on purpose; rain and wind are equally unfavourable; an absolute calm and a moderate fog suit it best. The ground should be neither too wet nor too dry. When the sowing is performed at such a propitious juncture, the corn swells and sprouts immediately, as I have often experienced. Now by covering it with the harrows, you have an opportunity of making use of these favourable precious moments. Every pair of oxen, and each horse, can work one on this occasion; by which means so much corn may be so quickly covered, that the sowing sometimes is finished in one fine day, if the domain is not very extensive. When you sow with the plough, as in those lands which are in furrows, it is tedious work, and takes a fortnight to sow a domain of any considerable

siderable extent, because the ploughs require more oxen or horses to draw them than the horses do; are slower in their pace, and do not cover near so much grain; neither can one take advantage of a favourable time so well, unless the weather continues settled for a long space of time. These are the inconveniencies that attend sowing under furrow. However, it is not those, neither is it the quality of the surface of the ground, whether rich or poor, sandy or strong, that must determine us in what form we are to work it; it is the bottom must decide that, by sounding in different places to the depth of fifteen or twenty feet, either by making holes, or, at less expence, by the borer I have before mentioned.

Some soils require to be laid in ridges, and others in beds, or totally level. Wherever a bed of marl, clay, or other unctuous earth which detains the water, is found to lie under the staple, in such soils it is necessary to plow in ridges, that the water may be drained off in the furrows, otherwise

wise these grounds, in which the water cannot lose itself, are subject, especially in rainy winters, to be drowned. Such is the nature of almost all the lands in *Angou, Maine, Touraine*, and divers other provinces and countries, which are plowed in ridges, and where I have bored in various places. It would be imprudent, in such soils, to change this practice; the wet would then do more damage, and the crops would be less.

I shall remark upon this subject of ridges, that most most plowmen make them indifferently in any direction, according to their old practice or fancy. However, it is not a matter of indifference in what direction the ridges are made. Where there is no obstacle, that is, in level ground, it is essential that they should run always from north to south, and not from east to west. Those which are in this last position, present in winter but one side to the sun, and are consequently partly thawed about noon: the following night the same side is again frozen,

frozen, and thawed again when the sun re-appears. This repeated influence of the sun puts the corn, if I may so express it, between two frosts, and kills the greatest part of it; insomuch that in the harvest there is very little found on this side of the ridges, which diminishes the crop almost half in half. Such ridges as are made in the direction from north to south do not run the same risque; they only present their tops to the sun, their sides receive his rays obliquely, and are not heated and thawed in the same manner: the crop is always more equal, and the produce better.

I have, in all my plowed lands, changed the direction of my furrows, where I could conveniently do it, in this manner; and I have found the benefit of it. The same should be observed in these waste lands when cultivated, even in those which are sown in flattish beds; though this observation is not in them of near so much consequence. It is of no use to regard this in mountains or hills; this position
on

on such grounds would be inconvenient. You must take care not to make your furrows here from top to bottom. The rains would waste the soil, and would carry all the virtue and strength into the valley. In such situations the furrows should be made to cross the fall or declivity, not only to remedy the above inconvenience, but for the ease of your team, which would not be so hard worked as if they plowed directly up the hill. There necessary gutters should be made, crossing the furrows, not in a direct line, but zigzag, to break the rapidity of the course of the water, which otherwise would do damage. Those grounds which are best adapted to be laid in beds, or plowed quite flat, are such as imbibe the water; that is, let it pass through, as all grounds do which have subterraneous quarries, or a bed of stones of a sufficient thickness, or gravel, or sand, or other porous bottoms. In such soils it would answer no purpose to plow in ridges: such is the texture of the soils about *Paris*,
and

and of divers provinces and countries, which are plowed in beds, or quite flat, as I have found by boring in different places of them. Those in which the water sinks the quickest, ought to be laid quite flat, and such of them as imbibe the water slower, in beds.

This is the original reason of plowing in ridges, beds, or totally flat. Such were the motives which determined our antient husbandmen: they are founded on reason, and the nature of the thing itself, and not the effect of chance or custom, as many have thought. I do not say, that the nature of the subterraneous strata has been constantly considered with attention, and followed every where, or that there are not tracts of land, where one of these methods of plowing has been followed, when the other was the fittest. Often in the middle of a country, nay of one domain, where, with reason, one of these methods is avoided, it happens that part of the soil demands a contrary practice; but this detail will be, for all men, in all countries,

countries, sufficient to instruct them in what manner they should plow their waste lands that are thus newly improved, and shew them, by means of the borer, if the method pursued in this part of the country is the best adapted and fittest for the nature of the soil.

As to the little freeholders and farmers, who have but a few acres, and after having grubbed, cleared, and burned them in the manner before-mentioned, labour them by the strength of their arms with the pickax, shovel, spade, or other instrument, and wish to sow in one of the above-recited methods; they must take care to mix the ashes well with the soil, and to carry off all the stones and roots. These are they who will, in proportion, reap the most corn the first year, as digging stirs the ground much better than plowing. Were it possible to cultivate all ones ground thus with the spade, it would produce a great deal more.

I say nothing of the choice of seed, and the preparation of it; every body is sufficiently

sufficiently acquainted with these things: however, I recommend that the greatest attention may be had to them, and no cost spared about them.

With respect to the species of corn to be immediately sown the first year after this husbandry, that must depend on the quality of the soil; which, if it be rich, will bring wheat; that which is not so rich, will produce mellin, that is, a mixture of rye and wheat, with more or less of the one or the other grain, in proportion to the abilities of the soil; that which is of an inferior quality and poorish, may bring rye. We may form a judgment of this upon the spot, when the operation of burning is performed. In general, except where the soil is excellent, or that kind of fat sand which is found in the valley of *Beaufort* in *Anjou*, and in some other countries, which, tho' it is called sand, is the best of all soils for wheat and other productions, I would advise the first crop should be preferably rye. There could be no doubt but that would flourish.

The

The year following you might judge by its produce, and by the plowings, of the nature and ability of the soil, and from thence be the better enabled to determine about its destination, without running any hazard. I have proceeded in this manner with regard to my improvements of this kind. I have likewise experienced, that rye succeeds commonly a great deal better than wheat, in the kind of light sandy lands in question. When they are afterwards enriched to a certain degree, they become fit to bring meslin, and after meslin, wheat; but though they should never produce any thing but rye, that would make no great difference in the profit, as I have before said.

I come now to the reaping of that piece of my new improved ground, which was sowed under furrow by the plough; this will be always, for the reason before given, about fifteen days sooner than that of the other corn of the same species in the country; which is attended with a double advantage: first, it gives more
time

time for the plowings. Secondly, labourers are easier got, and at a more reasonable rate, to mow or reap it; a method that I shall always prefer to task-work, that is, to the method of setting the cutting and threshing of one's corn to men, who take a part of it for their wages and nouishment, as is the practice in *Anjou*, where they have a seventh part of the corn for their hire. The same custom prevails in *Maine, Touraine, Poitou*, part of *Brittany*, and other neighbouring provinces; nay, there are places where the portion of these taskers is still more.

I have left off this practice, having found by an experience of many years, that it is every way more profitable to hire men at daily wages to do my harvest work. I give twelve pence a day to the men, and ten pence to women, able to work at it; to sturdy boys, whom I employ, I give proportionably. The same men may, if required, thresh the corn directly as is practised in *Anjou*; but when there are barns large enough to house it,

it is more advantageous to defer this business till winter, for several reasons generally known: it is what I have done, and what I advise all those who have barn room to do likewise. Though labourers should be dearer in another country, whether they are paid partly in money and partly in food, or whether they receive nothing but their pecuniary wages, which is most convenient, yet they are always to be preferred to taskers.

These last, for their private interest, present themselves in a small number, when they make their bargain; and as you cannot afterwards increase their number, the work is slow and tedious; if bad weather ensues, the corn sprouts, to the great loss of the owner, who, unless the rain is continual, is not exposed to this accident when he employs men by the day, because he may instantly set on as many men as he judges necessary, and may in case of necessity increase them to what number he pleases. He chuses the first fair weather to begin his work with diligence;

diligence; and, provided he looks to them, his corn is better cut by these men, who have not any interest to flabber it over slovenly, and leave the short corn, that they may the sooner have finished their task; and moreover the corn is much sooner got off the ground.

The poor peasants of those countries where this task-work is established by custom, need not be alarmed with any fears that this change in the manner of the harvest-work will affect or prejudice them; so far from it, they will benefit by it: The poorer they are, the more vigilant we should be over their interests, and endeavour to procure them by their labour not only a reasonable subsistence, but wherewithal to make them easy and content. They will reap and thresh the corn as before; their wives and grown up children will help to mow or cut it. In those countries which I speak of they are seldom employed in this work, upon account of the jealousy and misunderstanding of the taskers, who reduce these

women and children to the pafs of having scarce any employment during the summer, and of lofing the precious moments of harvest in gleaning up and down the country; which small emolument should be solely referved for fuch poor as depend on the publick charity, that is to fay, for thofe who are not capable of working.

Another great advantage would accrue to the peafants from the change of this custom, for as the freeholders and farmers would be the richer by their harvest being got in without lofs, they would be able to employ the whole year round day labourers at different work; which they could not poffibly afford to do, if they were bad in their affairs; which would often be the cafe, if they made ufe of taskers in rainy feafons, when part of their corn would be fpoiled. There is a connexion between the rich proprietors who occupy their own land, whom I rank here with the fubftantial farmers on the one hand, and the poor peafants or
day

day labourers on the other; which connexion causes the subsistence and livelihood of these to depend upon the good circumstances of those. They that have lived in the internal provinces of the kingdom, are convinced of this truth: this dependence and balance should be carefully maintained, the prosperity of the country depending upon it; whenever it is infringed, either on one side or the other, every thing will go ill. This dissertation upon the taskers has appeared to me to be necessary; the public benefit, as well as the private interest of the inhabitants of each province, depending much upon their getting in their grain with as much speed and as little loss and damage as possible.

This object merits the greatest attention: when corn is cheap, the taskers are saucy, and let a great deal be lost; in dear years it is much worse. At such times I have often known these taskers refuse to cut the corn, though they had before undertaken to do it; neither could

they be kept to their bargain, for it would be in vain to sue them, as they have not wherewithal to answer and pay the damages. The reason they alleged was, that the crop was not good enough for them to get as much wages as they wished to do. The landowner or farmers, having depended upon these people, and not having provided other workmen, could not find a sufficient number in time : by which means their corn was lost, at least a great part of it, which increased the famine in the country. How much corn is lost in this manner in the kingdom ? It is incumbent upon all to concur in putting a stop to this abuse, which occasions a considerable loss, the more to be lamented, as nobody profits by it.

I return to the labourers employed in harvesting our waste grounds under cultivation ; they may this first year cut the corn, wheat or rye, as close to the ground as possible, that is the best method for dispatch ; moreover, it saves the expence of mowing the stubble, which at first is
of

of little value ; however, if there is any left, it may be burnt, if it is thick enough to take fire. Where it is absolutely wanted for litter (for it is fit for nothing else), it may be cut or plucked up by men who should follow the reapers, with a view to plow the ground speedily. As soon as the land is cleared, a first plowing must be given it with a light plough, in order to bury the roots of the stubble.

In a few days it must have a second plowing in the same direction, and with the same plough, which should go a little deeper ; afterwards it should be cross plowed twice, going to a sufficient depth ; then a fifth plowing must bring the furrows back into their first direction. Between these five plowings, to be given with the plough with one ear, and the precautions indicated above with respect to stones and roots, the ground must be several times harrowed, as I have already said ; all these plowings and harrowings will pulverise the earth, and mix it equally with the ashes. If this ground is to re-

main in ridges, this will be sufficient until the sixth plowing, which must be given it some days before it is sown, and which must be performed by the plough with two ears, to bury the corn; but if it is to be sown in broad butts, or totally flat, the instructions I gave touching land cultivated this way must be followed. In whatever manner these cleared grounds cultivated with the plough are sown, they will not require near the same number of hands to break the clods this year, as were necessary the last. With regard to the quantity of seed, a little more must be allowed than the first year, that is to say, a third less than is generally used in the country of the same kind of grain, on the same quantity of land.

As to those small spots of land which are dug, as I have mentioned, as they soon acquire a greater degree of perfection than the others, and preserve it a long time, they must be always cultivated in the same manner as at first, and from time to time they must be manured; for I
pre^{sume}

presume they are destined to produce nothing but corn, pulse, or other productions that sell best; it would be a pity to plant these with wood.

In speaking of sowing corn in lands cleared and husbanded as above, and cultivated with the plough, I have not directed the laying on any dung, as it does not need it. If hereafter it should be sown for a wood, which it should not be till after a certain time, that is to say, till after it may be exhausted by crops of corn; this land, so worn out, is not the worse, but better, for wood, than if it had been at first sowed with it, a step I should never advise. The soil being not then sufficiently pulverised, and which is attained alone by a continual cultivation for corn, for several years. During that time this land must be well plowed, as I have explained, to get as much out of it as possible, as well of corn, whether wheat, meslin, or rye, as of other grain. The worst will produce three years successively,

cessively, and the rest four or five, sometimes even longer.

The first crop will not be the best; it will often be indifferent, the soil being so lately broke up; it will be however sufficient to repay the greatest part, if not all the expence of the process of the culture. The second will be much more abundant, and all or most part of it clear gain. The third will likewise be good; so will the following ones, if the soil be rich enough to support them longer: you may even, the last year, sow chesnuts with the corn, or acorns, or beech mast, and other wood that may be suitable to it. At harvest you must cut this corn very high, not to injure the young growth of plants. Many thus sow corn mixed with the wood, and think they do not hinder each other from growing. I have tried it, and found that the corn enticed cattle to trespass, and break the ditches, and brouze the young plants, unless great care was taken to watch them. Moreover, as it was necessary at harvest to cut

cut this corn very high, for the reasons just given, the shortest ears were left, and many of the others were shed considerably on the ground. This grain did not fail to grow ; it degenerated at length into weeds, which exhausted the land, greatly injured the young plants, and equally enticed cattle, particularly in spring, when the meadows are shut up, and pasture is scarce. After taking a great deal of pains to destroy all the seeds of grass, I had the mortification to see them come up afresh, to the great detriment of my young nursery I had sowed. The remedy I applied, and which I advise every-body to follow as the surest, was, to keep the ground under corn the number of years I have indicated, that is, proportionable to its strength. After the first harvest, I plowed it carefully as usual, and as often as if I had intended to sow it again with corn ; but, instead of that, I sowed it at a proper season with wood alone, which I had covered in the driest parts with the harrows, and in the wet places by the plough,

plough, leaving these in ridges. The nurseries I sowed in this manner thrive much better and grew much faster than the others; the cattle did no mischief, as there was no grass to tempt them in. It will even be some years before it shoots again, as the action of the fire kills it for a long time. These plantations, which, having been fenced in, will, at the end of three, four, or five years, according to their growth, be by that time out of danger, it is a pleasure to see them at this instant; they consist of different kinds of wood, according to the different natures of the soil; I neither dug nor plowed them the second or third year, as is the practice; this would have been a useless expence, and might possibly have hurt their roots. The land which had been cleared by the operation of the fire, and cultivated afterwards in the manner I have explained, is so thoroughly fallowed and cleansed, and acquires so kindly and favourable a disposition, that the wood prospers in it to admiration. After having practised several

veral other methods of sowing, as well with the plough as the hoe, spade, and other instruments, I was convinced that this was the best, the surest, and the quickest. Woods thus sown outgrow, even in a few years, those which have been planted at the same time, and at a great expence, with strong plants with good roots, and which have been dug and dressed often; they are always more beautiful than these, taller, straighter, and of a finer bark. All the lands managed in this manner, that shall be sown for wood, will succeed equally; however, except there be particular reasons, none but the poorest of them should be thus employed; as corn without dispute merits the preference.

Consequently from this motive, if you destine this burnt land, that is plowed, always to produce corn, either wheat, meslin, rye, or other grain, and that the soil is not sufficiently amended by a great quantity of ashes; I advise, as for the best, to dung it the second year, before you sow

sow it, as above directed. You must however give it but a very moderate coat, that is, nearly as much as is generally used to dung an equal quantity of land in the country. But it will be asked me, Where is this dung to be got? We have not sufficient to supply those grounds which have been always under culture, and we must not pretend to carry on these our new improvements, at the expence of robbing and impoverishing them. I shall surmount this difficulty, and shew the means of procuring it. They consist of the different methods of making every year artificial dunghills, of which I have already treated. I shall begin with the easiest.

In every country, some time before winter, and in *Anjou* about the 15th of *November*, it will be expedient to cleanse all your yards, courts, and sinks, and to pare them, and hollow them to the depth of a foot below the level of your buildings; afterwards, if you have any waste commons, you must bring from them
 wcl heath,

heath, that you have had cut, or that you will cut fresh as you want; you must lay a bed of this, to the thickness of two inches, upon all the surface of your yards, courts, and sinks. If you cannot get heath, in the place of it you must use stubble or rye straw, of which you may put a thinner coat or bed, you must then take from a piece of waste ground next the house, or from your headlands, or in the hedges or woods, turfs or sods, or the upper soil, to the depth of six inches. These you must carry immediately to your yard, &c. and spread them equally upon your bed of heath, stubble, or rye-straw, six inches thick. If the waste land that you would peel is not near enough to your house, and if that is so situated that there is no other waste ground at hand, nor headland, hedge, or wood, in this case you must not hesitate to take the upper soil from some neighbouring field, to the depth of six inches, chusing some ground that is higher than the rest, if such there is, in order to render this field more level, and

and you will lay this on your bed, as abovesaid, to the depth of six inches.

You will let this bed of litter, fods, or soil, lie about a fortnight, where you will throw upon it all sweepings and filth of your kitchen and house, that nothing may be lost, and all converted into manure. The wetness of the season, the treading of men, cattle, and carriages, that pass over this bed, will contribute greatly to rot it. Effectually to do this, after rain, you will drive all your cattle of every kind backwards and forwards over it; it will soon turn to a kind of mud mixed with litter. Afterwards, in about fifteen days, or thereabouts, you must cleanse with shovels and forks all these yards. If the kind of dung should be too liquid, which in rainy seasons is often the case, you will put it up in little heaps upon the same ground to drain. Then you will carry it to your dung-hil, which should be a hole sufficiently great, and dug on purpose in or near your farm-yard. This hole must be in a dry place,

place ; for no manure must ever be put in water, which would wash, absorb, and dissolve all the salts, and lessen their quantity, if it run off elsewhere. In proportion as you put this artificial muck in the dunghil-hole, you must mix it with a third part of your stable and other dungs. When this is done, you will the next day begin afresh to spread a coat of litter and of soil upon your yards, in the same manner as before recited, to be taken up, mixed, and deposited equally in your great dunghil-hole, in about fifteen days time : and thus continuing to do during the whole winter, and part of the spring, you will have two supplies in a month of this compost.

The trouble and labour of this is not very costly ; every-body, even women and children, can be employed at it, and this is an idle time of the year. The fine weather being arrived, you may still continue this work ; but then the drought will not suffer the beds to rot, and you cannot take them up but after two or

three months lying. You must put these last takings by themselves, for reasons I shall explain to you.

Thus your manure may be trebled. Before it is fit for use, it must lie in your dung-hole six months to rot, and it must be wetted now-and-then, in dry seasons. During this time it heats, ferments, and acquires an excellent quality, and for some soils is better than the pure horse-dung from your cattle; it is more natural, less fiery, and lasts longer. As to the last summer takings, which I bid you set apart, as they will not have had time to putrify to a degree of perfection before seed-time, you will keep them, to employ them on the first occasion the next year, and you will have reason to be satisfied with them likewise; if this sort of dung could be kept for two years, it would be still better. It is easy to make, and suits most soils. Farmers that have no great yard, may do the same where they may have best opportunity; and the poor peasants, who have neither yard nor court,

court, may practise it before their cottages, and in their gutters and kennels.

I proceed to teach you another method to supply a good manure of a different sort.

In speaking of artificial dung, the manner of making which I have just now explained, I said, that the hot weather being come, there could no great quantity be made by reason of the drought, until the latter season set in. Let us endeavour to supply this interval; and, since humidity and water are wanting, let us have recourse to fire. To this end, about the beginning or middle of *April*, during the first fine weather that shall happen, you must in various waste places, the nearest to this burnt and peeled ground which you would sow for the second year, take up with the cobbing knife turfs nearly of the same dimensions and thickness specified in the article that treats of the operation of burning. You must let them dry on the spot, but not so much as was required for that operation; afterwards you

must put them into round heaps about ten feet high, like those of the husbandry by burning before-mentioned; and you must in like manner form a kind of little chimney in them.

In making these heaps, you must put in the middle of each a little dry wood, or, for want of it, heath, stubble, or straw: these combustible matters are necessary for the inside, as these turfs, not being sufficiently dry, would not burn without it. They ought not to be quite dry; for these sorts of heaps, different in that from those of the preceding mentioned husbandry, burn very slow, that the earth may not be too much baked, to give more ashes, and to make them of a better quality. The heaps thus formed, you must set fire to them. To keep it from extinguishing, you must order some of your servants or labourers to visit them at their leisure every day, to stir them up as occasion may be, and to add fresh turfs, cut in some adjacent place, which they had prepared and left
to

to dry a little. These furnaces, thus heated, and managed after this manner, will burn continually, let whatever wet fall, until the great rains of autumn. You must from time to time draw out, without extinguishing them, a part of the ashes, which would otherwise be over-burnt; and you must put them into heaps hard-by. When seed-time comes, you may let these furnaces extinguish, you will then have a fresh quantity of ashes. This manure spread on the plowed grounds, with the precautions above-mentioned of not letting it evaporate, will be excellent for corn, as I have already said; it will be equally beneficial where-ever else you are pleased to make use of it; among others, upon meadows. The use of these furnaces is very advantageous; about me they are called perpetual furnaces: they afford a great quantity of ashes, and a small quantity of them will manure a considerable tract of ground, which would have taken a great deal of dung. I make use of this method to amend those grounds

which are most remote from my house, and to which it would be difficult to carry dung. These furnaces cost little or nothing, and the attendance they require is insignificant, the poorest peasant may easily make enough for his own private use; it is true they smoke the neighbourhood, but they are for that reason made at a distance from houses; moreover the inconvenience of this smoak is not very great, and not to be considered, when the advantages of a plentiful harvest, which these ashes cause, are comparatively estimated. In those parts of the country, where there is none of these waste grounds, nor hedgerows, nor woods, whence to take these turfs, you may take a sufficient quantity for these furnaces from off some pieces of your fields before you plow them.

Without including the amendments which I have mentioned in treating of the quick hot sands, there are divers other methods of making artificial composts, and to procure ashes either from leaves and weeds,

weeds, or fern, broom, and furze, and different wild productions. As these methods are generally known, I shall not say more about them; every body will take advantage of them according to his occasions, convenience, and situation. The artificial manure, and the perpetual furnaces which I have now described, are sufficient for land treated according to the peeling or cobbing husbandry. I thought it the more expedient to direct the manner of making them, as they will be useful in all countries and all soils, and as there is scarce any place, however badly situated, but where this manure may be made.

Thus we are now enabled to manure our waste land, cultivated as above directed, when plowed, and destined to produce corn always. I said, that I advised it should be dunged the second year before sowing; which will be found to be very advantageous, notwithstanding the opinion of those who think that fresh lands are sufficiently fat and rich. There are very few of them but what will

be the better for dung, and the second year it will be extremely beneficial, as I have experienced on my own lands. Since I have cultivated them in this manner, and made use of the said artificial manure and perpetual furnaces, they are vastly more fertile; the crop of the second year, of which I now speak, was excellent, and that of the third equally good. The fourth year, I put on as much manure as at first; which procured me two more crops equally good. Thus I sowed, for five years running, the most of my lands, which I had cultivated with the cobbing-hoe, and they constantly afforded me plentiful crops; though, for the most part, the natural soil was but very indifferent. Some of these lands I sowed for many more years, and they produced almost equally well, by manuring them every other year. The same success will be had with all such as shall be treated in the same manner: but, in general, I am of opinion it will be best, not to sow them for more than five years together, including

cluding the first crop, which I have declared to be the worst of all. At the end of this period you must let them rest, and afterwards fallow them with your other corn grounds; to be successively sown with the greater or lesser grains according to the usage of the country.

The lands thus brought into tillage by the means of burning become infinitely better than the others, and produce a great deal more: they call them in *Anjou* cobbled lands, from the name of the instrument which I have mentioned; the operation for the same reason is called cobbing, and the men who work at it, cobbers. This process improves the soil for more than twenty years: for a considerable time, not so much as a blade of grass grows in the corn; there is scarcely any as yet appears in the lands I cobbled the first.

All the nourishment of the earth, not being spent upon other plants, is preserved for the benefit of the corn alone, which shoots with vigour and has a fuller ear,

ear, without the necessity of being weeded : when it is threshed it is so clean, that it requires nothing more than to be winnowed. The bread made of it is excellent, and of a superior quality. When in process of time these cobbled lands shall produce as much weeds and grass as your other plowed lands, they will then be in the same degree of imperfection ; but it will be a long time before this will happen, neither can I say when, as I never yet have seen an example of it : but there is always a sure remedy and certain means to re-establish them in their first state of perfection, which is to let them rest for two or three years, in order that they may have a new sward sufficient to have them cobbled, &c. afresh. This second cobbing will not be near so expensive as the first ; because there will be no roots to grub up, nor stones to carry off, and the few clods will be easily broken. I have in this manner cobbled, with great success, lands that had formerly been in tillage, which would no longer bring corn because

cause they were exhausted, either by consecutive crops or by the great quantity of weeds, which impoverished them : these became as good as my regularly cobbled lands.

I have used the same means to restore worn-out meadows : I have new-sown them with grass seeds, and they have produced a great deal of excellent hay. I had previously collected for many years a large quantity of seed, upon such of my meadows as were not too moist. Many of my neighbours have followed the same method with equal advantage : it is the most powerful restorative to worn-out land. It evidently follows from all that has been said, that the method of cobbing and burning the soil is, without contradiction, the best and surest means either for cleaning or restoring grounds. It is the making an acquisition the most advantageous on one's own estate ; the profit of which is by this means doubled, often trebled, and sometimes quadrupled. Thus to enrich one's self, and that at the
 expence

expence of nobody, and at the same time enrich the state, is worthy of a good patriot, and acting like a respectable father of a family. By following this husbandry all this is attained ; it was known time out of mind in *Anjou*, as well as in divers other countries, but in a very imperfect manner : I will venture to say it was never pursued to that degree of perfection, to which my practice has carried it ; doubtless because nobody applied themselves particularly to it : nay it had been so much neglected and disused, that it was almost intirely forgot in my part of the country, when I began my cobbing husbandry. To finish this article of cobbed grounds, I proceed to relate the cost that attends bringing ground into profit by this method.

In that part of *Anjou* where my estate lies, a digger or day-labourer is paid in winter, that is to say, from *All Saints* to *Easter*, eight pence ; and in summer, that is to say, from *Easter* to *All Saints*, ten pence. The hire of a woman in winter

ter is six pence, and in summer eight pence. During the harvest they give twelve pence to the men, and ten pence to the women, as I have before mentioned. With regard to the children, whom I have mentioned to be employed in sundry operations of this cobbing husbandry, at which they may work from seven and eight years of age; they are paid according to their age and abilities: the smallest at the rate of two pence or three pence a day, the others may get four, five, and some six pence. As to the cobbers, as their work is more toilsome than common, while they are cobbing and peeling, they get twelve pence a day; afterwards they get only the usual hire of the country in the season. All these different wages above-specified are for both nourishment and hire. At these same prices, the lands of the second kind which I cobbled and burnt cost me generally in all (not however including the seed nor the teams employed in sowing) about thirty livres the acre

acre of the country; which is larger than the Paris acre.

The acre in *Anjou* contains a hundred square perches, each perch being twenty-five feet. At *Paris* it is composed of the same number of perches, but they contain only eighteen feet: it is equally various in most provinces of the kingdom. By means of the prices which I have here given, one may estimate with certainty the cost of cobbing, &c. in the same manner, the acre or other measurement in any of the provinces. The experiments I have made in *Anjou* will serve as a scale to compare by. This estimate should be made by taking into consideration the wages usually given in the country to a day-labourer, and by adding a fifth more, which should be always given, as I do to my cobbers: that is to say, in a province where the custom is to give a labourer fifteen pence, a cobber should have eighteen pence; consequently an acre of ground of the second kind, and of the same size with that of *Anjou*, will there cost forty-five

five livres to cobb, &c. which is a third more than in my country ; but in the most of the provinces it will be cheaper : there are several where the cost will be the same as in *Anjou*, and in some less. However, where the labour is dearest, the rent is proportionably less ; one will balance the other, and every-where your money is laid out to great advantage, and at a high interest. If the waste lands, you would by this husbandry bring into tillage, are reputed bad, that is to say, of the first kind which I have specified, they will be easier to stir than those of the second which I have last spoke of, and they will not cost so much to dress and manage ; they will however produce less : but if they should be found to be better, I would say, of the third kind, of which I am going to treat, they will be laboured with more difficulty ; but in return will produce somewhat more. Whatever be the nature of the soil, by these means somewhat may be always made of them.

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The good soils, according to my division, form the third kind : I comprehend under this head all strong, fat, clayey, and, in general, all soils which cling to the feet. There are of these, some whitish, yellowish, redish, brown, and black. They generally, in proportion to their goodness, produce grass, black and white thorn, brambles, juniper, heath, fern, and other weeds. I have already said a judgment may be surely formed of the nature of the soil from the height, thickness, health, and vigour of these productions. Tho' this sort of soil is looked upon as the best, it often happens it is not in reality so good as that of the second kind ; but it has commonly the advantage of being good for wheat or messin.

When any of these soils are to be cobbled, &c. you must not forget, in the first place, to free them previously from the three obstacles I have before often mentioned ; that is to say, from water, stones, and great roots ; afterwards you must

must cobb it in the season and manner before directed. If the weeds and other wild productions are few and rare upon this soil, in this case you must peel the fods or turfs thinner than I required, lest they should not burn for want of a sufficiency of combustible rubbish hanging to them; but if they have enough of that, which may be easily tried, then these fods must be peeled to the thickness of four inches, as is already said.

As I have particularized the other operations of this husbandry by the means of burning, I shall not again repeat them here. Wheat may be sown the first year where the land is rich enough; where it is poorer, meslin may be sown, with a greater proportion of wheat than rye, according to the degree of goodness of the ground. Afterwards this ground must be dunged, plowed, and sowed, the same number of years, and in the same manner as was before explained; observing the distinctions I have made between those grounds thus husbanded, with a view to

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be perpetually arable, and those intended for sowing to wood. However, I believe it will be but seldom, and from particular motives, that such soils as I now speak of will be employed under wood. It will turn to much better account to sow them with corn: those which at first would not produce even meslin, in two or three years will be in a condition to bring all wheat. These soils have, moreover, another considerable advantage; they calcine, or turn mostly to lime by the action of fire; they burn slower than those of the second kind, and afford a greater quantity of ashes; which, from the reasons I have given, augments their fertility.

However there are soils of this third kind, which produce so few weeds or other wild productions, that it is not possible to take up the sods sufficiently furnished with plants to enable them to be afterwards burnt. When such lands are to be brought into tillage, instead of cobbing them, you must, in the spring, dig and break them with the spade and
picks

picks by day-labour, and leave them to toast and dry for a month or six weeks: then send in your women and children with iron and wooden rakes, to shake and break the turfy clods, and to separate the roots that cling to them; these roots must be sufficiently dried while the sun is in his ascension; heaps must be made of these here and there, and they must be burnt, and the ashes spread with shovels on the ground, and covered in as soon as may be with a plough *with one ear*. Afterwards in succession, during the heats of summer, with the same plough you must give it several cross plowings, to endeavour to destroy all the wild productions, and to pulverise the earth. Between these plowings the same women and children must break all the clods in the manner I have directed in treating of lands of the first kind.

When the usual season for sowing in the country comes, it will be time to sow this land, either in ridges with the *two-ear'd* plough, or in flat butts, or quite flat

with the harrows, as shall be judged best ; but you must take care not to sow it the first year with either wheat, messin, or even rye ; for ground thus cultivated only is not like that which has been copped : the operation of fire, which this last has suffered, absolutely destroys all the seeds of weeds and other wild productions, as well as all worms and insects ; it likewise corrects, in a great measure, the barren dullness of the soil. The first, which has not been corrected and amended by the like operation, retains its impotent barren inactivity, as likewise its worms, grubs, and insects : abundance of the seeds of weeds and wild productions still remain, and when it is sown with wheat, messin, or rye, these grubs and insects attack and devour the sprouting corn.

In spring the seeds of these weeds and wild growth come up, they rob the corn of its best nourishment, and almost entirely choak it. What remains, after having surmounted all these obstacles, produces nothing in a manner but straw,
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and no grain or but very little. I have experienced this, and was convinced, that the lands brought into tillage in this manner alone were fittest to be sown with winter oats; this will struggle best with all these different evils, and will give more grain. The crop, however, will not be the best, but will be tolerably good. As soon as these oats are cut, during the hot weather, you must give the ground several cros-plowings, to intirely break and pulverise the soil, and to endeavour to destroy effectually all the roots of weeds and wild plants. You must then manure it either with dung, or with those composts of which I have spoke. You may even make use, if there is occasion, of some of the amendments I have mentioned, such as marl, lime, and others. If the soil should be too binding and quite hard, and split and cracked in the heat of summer, you must lay some sand on it; it will, as I have experienced, separate the particles of this too stiff soil, and render it more loose and fertile. These operations being

performed as much as may be necessary this second year, it may be sown with wheat or messin, according to the degree of its goodness, and the crop will answer to your satisfaction. You may sow it again in the same manner the following year, without any necessity of dunging it, and you may expect a still greater crop. After this you must let it repose for a year, and continue in tillage with your other arable grounds. This method of breaking up waste land does not immediately enrich the soil so much as when it is cobbed.

The first crops are not near so considerable, and it is a great while before it acquires a degree of fertility equal to that which is given at first by burning; nay, with all the labour bestowed on it, it never arrives at the same degree of perfection, neither can the grass and weeds, as I have experienced, ever be thus totally destroyed: consequently the corn is never so clean and pure as in the cobbed grounds. Though this manner of bringing waste
grounds

grounds into profit costs less than copping them, yet I do not advise any body to use it but on the greatest necessity; viz. when one cannot do otherwise, and when the proper turfs cannot be peeled off the ground, or burnt for want of combustible matter adhering to them.

I have indeed seen, in different parts of *Germany* and *Switzerland*, woodlands thus grubbed up and brought into tillage, and the crops have been good. Neither was I astonished at it; for wood being in those countries plenty, and of little value, they had not only dried and burnt the stumps and roots, but likewise a great part of the timber; which had produced a vast quantity of ashes. The soil already meliorated by the leaves, was so enriched by these ashes that every thing must of course prosper in it. As wood is generally pretty dear in *France*, I do not imagine this method can be often practised, nor that many proprietors of land will be desirous of grubbing up their woods; as, considering the scarcity, we ought rather to

seek to increase, than to diminish them: however, such as for particular reasons may desire to bring any of theirs into tillage, may make use of this method. I shall say no more on this subject, as I confine myself to speak only of waste and barren grounds; and that I am very far from judging such as are planted with wood, to come within that denomination.

As to the method of breaking up and cleaning grounds with the plough alone, without having previously prepared them by grubbing, &c. by men, I do not at all approve of it, except for those hungry sands of which I have spoken, having, in all the attempts I have made elsewhere, always miscarried; it cannot be reasonably practised but in such places where there are no weeds or wild plants, or at least a very few. The first plowing must be given at the end of winter or beginning of spring, while the ground is still wet. If you wait till the spring dries it, it would be so hard that the plough could not enter.

ter. The second plowing should be given across as soon as may be; and it is required to give it several successive plowings in different directions, principally during the summer heats, to endeavour to destroy the couche-grass, and other weeds, whose roots must after all be raked out and put in heaps, and burnt in the middle of the field, as I have before said. Although this work is very fatiguing to the teams, and that many ploughs are broken at it, yet the first year winter oats are the only proper feed to sow in it; and from these we have but a bad crop, for the soil still retains its impotent sterility. The seeds of grass and weeds shoot up, and it will require many years labour and tillage before the soil is brought to be good. Those who take this method, as the least expensive of all, in the end find they have saved nothing, and often run the risque of being losers by it.

There are many other methods of breaking up barren lands, which I do not mention, because they are inferior to those
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I have related. There may no doubt be many more very good, with which I am not acquainted; for I am very far from having exhausted this very copious subject: I am in hopes still to arrive at many new discoveries in this extensive science.

I have hitherto deferred to say any thing of hedges, ditches, and young trees, because it was first necessary to bring the soil into profitable order. It is of great importance to inclose those grounds you have brought into tillage; and, if they are of a considerable quantity, to divide them into several fields with good ditches, on which you must plant hedges and trees of different sorts, at certain distances. You may put fruit-trees on some of the ditches, in the middle part of your inclosures; but this should be done with caution, and at a good distance from each other, for otherwise they would injure not only the corn, but they would be an impediment to the plough. The use of these hedges, ditches, and plantations, is generally acknowledged, and cannot be
too

too much recommended. There are countries, as in a part of *Brittany*, where they are of such value, that they are estimated separately from the value of the land; and the landlord cannot re-enter at the end of his tenant's term, until he has allowed for them. If the waste lands that are cultivated are of a vast extent, or so distant that you cannot bring them in yourself; and if they are not near enough to a hamlet or village, for you to let them at a reasonable price, you must by degrees build houses upon them, and parcel them into farms, rather small than great; it being certain, that the more an estate is divided, the better it is cultivated, and the more it produces. These houses may be built with the stones that are picked off the very lands thus cultivated, of which I have before spoken. Thus nothing is lost, and every thing is turned to profit; neither will this expence be so considerable as may be thought, the first crops, which for that purpose should

should be reserved, will answer it; I have tried this on my lands, with advantage.

The means I have prescribed for draining wet lands, may be used in morasses with equal success. As to the method of clearing, cultivating, and bringing them into tillage, the most suitable without all question, for whatever produce they are designed, is to cobb them and burn them. The operation of fire, which they have greater need of than other lands, gives them a surprising fertility; I have experienced this on those lands which I have made profitable by these means. There might be much said on this article of morasses, but that would be too prolix; therefore I shall not expatiate more upon this subject, for the reason which I have given in the beginning.

As I only treat here of waste and barren lands, I have said nothing of chalky soils, because they are more nearly allied to stone than to earth; such are met with in some countries; amongst others in a part of *Champagne*, where there are vast
tracts

tracts of this land, which have little or no superficial soil, and which are totally abandoned. The bed of chalk is often fifty feet in thickness, as is judged by the wells that are sunk, which have no occasion to be lined with any thing. These lands, which want soil, are certainly the worst of all, and much worse than the poor hungry sands. When they are broke with iron instruments to the depth of some inches, in order to plow them afterwards, they return at the end of some months to their former hardness. In that case, the farmer is never the nearer; however, there are means to manage it, by mixing of soil with it, or proper composts, to hinder the rejunction of these adhesive particles. It would carry me to too great a length to relate this process; it is a particular object which demands singular attention, and merits a separate discourse.

All the methods which I have related for bringing waste and barren grounds into profit, may be exercised in all parts
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of the world, by adapting the seasons in the different climates by those I have indicated in this country, and by the experiments I have made in *Anjou*; but the best of these methods is without doubt, as I have said, that of cobbing, and afterwards burning, it will succeed everywhere.

I shall not describe the different ploughs, antient and modern, which are in use in different counties; I shall only remark on this occasion, that they ought to resemble those machines and instruments which are by so much the more admirable, as they are the less complicated, and more simple. These ploughs ought to be so constructed, that the plowmen, with the few tools they carry about with them, may be able on the spot to mend them when they happen to break, that they may not lose their precious time in seeking for another plough, or in going for the plough-wright. In agriculture all the minutes are precious; most of the operations belonging to it are momentary;

mentary ; it is often of as much prejudice to anticipate them, as to retard them.

Neither shall I discuss the different methods which vie with one another for the better cultivation of the ground, and to render it more fertile.

The question here is, not to meliorate, but to bring into profit ; not to polish, but to prepare ; not to perfect, but in some measure to create and form.

I shall esteem myself very happy, and I shall think myself very well recompensed for all my labour and pains, if they should prove of any utility to my native country.

END of the FIRST PART.

